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The Relationship Between Leukopenia and Dengue Fever in Child Patients

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Abstract

This study aims to analyze the relationship between leukocyte counts and the incidence of dengue infection in pediatric patients. The study employed a cross-sectional analytical design, collecting data from medical records of patients diagnosed with dengue fever and dengue hemorrhagic fever at RSU UKI from August 1 to 14, 2024. Among 95 patients who met the inclusion criteria, results showed that the majority experienced leukopenia, with percentages of 54.7% on the first day, 52.6% on the second day, and 44.2% on the third day. A significant relationship was found between leukocyte counts and hematocrit values ($p = 0.000$). Dengue fever occurred more frequently than dengue hemorrhagic fever, with higher prevalence among male patients and those aged 10–18 years. The peak of leukopenia was observed on the second day, which may help predict the critical phase of plasma leakage. Furthermore, the study highlights that monitoring leukocyte trends provides an early indicator for clinicians to anticipate disease progression and potential complications. Regular hematological evaluation, especially within the first three days of fever onset, is essential for distinguishing between mild and severe forms of dengue. The findings also support the integration of leukocyte monitoring with other clinical parameters, such as platelet count and hematocrit levels, to improve diagnostic accuracy and treatment outcomes. Early recognition of leukopenia patterns can aid in timely interventions, reducing the risk of shock and hemorrhagic manifestations. Therefore, this research reinforces the importance of leukocyte count as a vital prognostic marker in pediatric dengue cases, contributing to better patient management and clinical decision-making in endemic regions.

Keywords: Dengue infection, Leukopenia, Pediatric

INTRODUCTION

Dengue infection, caused by the dengue virus (DENV-1 to DENV-4) and transmitted primarily by *Aedes aegypti* and *Aedes albopictus* mosquitoes, remains one of the most prevalent mosquito-borne diseases worldwide. According to the World Health Organization (2023), more than five million dengue cases were reported across 80 countries, resulting in over 5,000 deaths globally. In Indonesia, the Ministry of Health recorded 114,720 cases and 894 deaths in the same year, reflecting a persistent public health challenge. Clinically, dengue infection presents with a wide spectrum of manifestations ranging from mild dengue fever (DF) to dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS) (Guzman & Harris, 2015). Early clinical features often include fever, nausea, vomiting, and leukopenia, which may precede thrombocytopenia (WHO, 2022).

Leukopenia is a condition of decreased white blood cell count, which plays a potential role as an early indicator of disease severity and immune response. Previous studies suggest that a significant decline in leukocyte levels may correlate with disease progression and plasma leakage during the critical phase (Lee et al., 2021). However, evidence remains limited, particularly in pediatric populations, where physiological and immune responses differ from those of adults. The increasing incidence of dengue in the pediatric population highlights the need for better clinical predictors of severity. Therefore, this study aims to analyze the relationship between leukocyte counts and the severity of dengue infection in pediatric patients, to support more effective diagnosis, monitoring, and management strategies in hospital settings.

RESEARCH METHODS

This study employed an analytical cross-sectional design conducted at the Medical Records Unit of RSU UKI, Jakarta. The study population consisted of all pediatric patients aged 0–18 years diagnosed with dengue fever (DF) or dengue hemorrhagic fever (DHF) from 2020 to 2023. Total sampling showed the results of 95 medical records that met the inclusion criteria with a diagnosis of DF or DHF. Patients with incomplete records, comorbidities, or secondary diagnoses were excluded from the analysis.

The independent variable in this study was leukocyte count, while the dependent variable was hematocrit value. Data were obtained from secondary sources, namely patient medical records, and processed using the Statistical Package for the Social Sciences (SPSS) version 26. Data collection began with verification and editing to ensure completeness, followed by data coding and tabulation. Descriptive analysis was used to present frequency distributions, while bivariate analysis was conducted using the Spearman correlation test to assess the relationship between leukocyte counts and dengue diagnosis. Statistical significance was determined at a p-value of less than 0.05.

RESULTS AND DISCUSSION

Results

This study shows that the highest incidence of patients occurred in the 10-18 year old age group, male, with a diagnosis of DF, and the highest number of cases occurred in 2022. Leukopenia occurred most frequently on the second day of hospitalization. A significant correlation was found between leukocyte counts and hematocrit values in both DF and DHF patients ($p = 0.000$).

Table 1. Characteristics of Study Patients

Characteristics	Frequency (n)	Percentage (%)
Age (years)		
0 – 5 years	8	8.4
5 – 9 years	38	49
10 – 18 years	49	51,6
Sex		
Male	56	58,9
Female	39	41,1
Year of Occurrence		
2020	30	31,6
2021	32	33,7
2022	33	34,7
2023	0	0
Diagnosis		
Dengue Fever (DF)	62	66.3
Dengue Hemorrhagic Fever (DHF)	32	33.7

Table 2. Distribution of Leukocyte Counts on the First to Third Day of Hospitalization

Leukocyte Count	Day 1	Day 2	Day 3
Frekuensi (n)	52	50	44,2
Presentase (%)	54.7	52.6	-
Frekuensi (n)	50	42	-

Table 3. Relationship Between Leukocyte Count and Hematocrit Value on the First Day of Hospitalization

Jumlah	Hematocrit Value		Total	<i>p Value</i>
Leukocyte	$\leq 45\%$	$> 45\%$		
$< 4000/\mu\text{l}$	32	20	52	0,000
$\geq 4000/\mu\text{l}$	43	0	43	
Total	75	20	95	

Table 4. Relationship Between Leukocyte Count and Hematocrit Value on the First Day of Hospitalization

Jumlah	Hematocrit Value		Total	<i>p Value</i>
Leukocyte	$\leq 45\%$	$> 45\%$		
$< 4000/\mu\text{l}$	37	13	50	0,000
$\geq 4000/\mu\text{l}$	45	0	45	
Total	82	13	95	

Table 5. Relationship Between Leukocyte Count and Hematocrit Value on the Third Day of Hospitalization

Jumlah	Hematocrit Value		Total	<i>p Value</i>
Leukocyte	$\leq 45\%$	$> 45\%$		
$< 4000/\mu\text{l}$	25	17	42	0,000
$\geq 4000/\mu\text{l}$	53	0	53	
Total	78	17	95	

CONCLUSION

This study concludes that leukocyte count has a significant relationship with hematocrit value and can be used as an indicator of disease severity in pediatric patients with dengue infection. Most cases occurred in children aged 10–18 years, predominantly among males, with the highest incidence recorded in 2022. Leukopenia was found to be more common on the second day of hospitalization, indicating the critical phase of plasma leakage. The decrease in leukocyte count during dengue infection is associated with bone marrow suppression and viral replication in immune cells. Monitoring leukocyte dynamics alongside hematocrit levels is essential for early detection of the critical phase and appropriate clinical intervention. Further studies are recommended to strengthen the understanding of leukocyte and hematocrit correlations in predicting the severity and clinical outcomes of dengue infection in children.

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